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INTEGRATION OF LOCAL STREETS WITH THE ATLANTA EXPRESSWAY SYSTEM

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CITY PLANNING DIVISION

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INTEGRATION OF LOCAL STREETS WITH THE ATLANTA EXPRESSWAY SYSTEM

Karl A. Bevins,[1]

Government and Business Work Together in Atlanta

City, County, State and Federal agencies pool resources. The governmental agencies most active in the field of traffic improvement include the City of Atlanta, through its Municipal Planning Board and consultants (Harland Bartholomew and Associates), its Construction Department and its Traffic Commission and Traffic Engineering Department; Fulton County, through its Department of Public Works; DeKalb County, through its Commissioner of Roads and Revenues; the Metropolitan Planning Commission which is financed jointly by the City of Atlanta, Fulton County and DeKalb County; the Joint Bond Commission, a citizens' commission which administers the bond funds voted by the citizens of the City of Atlanta and Fulton County for traffic improvement; the Georgia State Highway Department; and the U. S. Bureau of Public Roads.

Businessmen take an aggressive and active part. To minimize duplications and avoid omissions, the Atlanta Traffic and Safety Council organized a Transportation Planning Council composed of one administrative official and one technical man from each of the agencies working on traffic plans. This Transportation Planning Council is an unofficial advisory group. Its work is done by special committees appointed for specific jobs. One standing committee, called the Technical Coordinating Committee, holds regular meetings and carries the bulk of the work load. This Technical Coordinating Committee is composed of the chief technicians from each of the member agencies of the Transportation Planning Council. Through this working committee, information and ideas are exchanged, work assignments agreed upon, and the results of special studies made available to all agencies.

Parking and Transit are included. The transportation picture in Atlanta has been rounded out by special commissions created by the Georgia State Legislature and financed by the City of Atlanta. The duties of these two commissions were to make comprehensive studies and recommend action which will insure that parking and transit needs will be properly provided for in future traffic improvement plans.

Some differences of opinion exist. Due to the wide variety of primary objectives of the agencies working on Atlanta's traffic plans, and the human element involved, some differences of opinion have developed. Most of the major differences have been resolved through numerous conferences. Those remaining give promise of being resolved in the near future.

This Presentation is Factual

Compiled from studies contributed by all cooperating agencies. The author wishes to emphasize that the bulk of the factual data presented herein was

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1. Traffic Engr., Atlanta, Ga.

obtained from agencies other than his own organization. Since this data is factual and since it represents the combined efforts of a number of responsible agencies, it is worthy of careful study by all persons interested in traffic plans for the city of Atlanta.

Outline of this Presentation

Information to be presented. To avoid confusion in the presentation of this complex subject, the story will be developed as follows:

1) The geometric pattern and traffic carrying capacity of today's streets.
2) The existing traffic flow pattern and volume.
3) The estimated traffic flow pattern and volume for the year 1980.
4) The proposed Major Street Plan to accommodate future traffic needs.
5) The role of the expressways in the Major Street Plan.
6) The basic principles of expressway ramp design in downtown Atlanta.
7) Conclusions.

Today's Street System

A radial pattern. Atlanta's existing street system forms a radial pattern with all of the principal arterials radiating from the central business district like the spokes of a wheel. No circumferential streets and virtually no cross-town streets exist (see Fig. 1).

Vehicular capacity is very limited. Very few streets with roadway widths of 40 feet or more exist today (see Fig. 2). Possibilities for one-way streets are scarce due to the small area covered by grid patterns and the lack of parallel pairs of streets. Many of the widest streets end abruptly at jogs or dead ends. Natural barriers in the form of parks and highly developed areas block the extension of other important traffic carrying streets.

One natural barrier "screen line" controls the useful capacity. The central business district, from which radiate most of the main streets, is completely surrounded by railroads. These railroads form a circular belt line which we have chosen to call the "screen line" (see Fig. 3). The streets radiating from the central business district and crossing this screen line will be referred to as "gateways." There are 29 of these gateways piercing the screen line. These 29 gateways provide, at the present time, a total of 74 traffic lanes. Of these 74 lanes, 37 are inbound and 37 are outbound. The practical operating capacity of these 29 gateways in one direction is 16,650 vehicles per hour (v. p. h.). The maximum capacity, which is an unsatisfactory operating figure, is 18,500 v.p.h. For all practical purposes this capacity of 16,650 v.p.h. is the useful capacity of today's radial street pattern.

Today's Traffic Load Exceeds the Useful Street Capacity

Radial streets carry the traffic load through the screen line. Existing traffic flow data shows that few streets, other than the radial system, now carry substantial amounts of traffic (see Fig. 4). The lack of by-pass routes accounts for this. As the city grows and new secondary focal points develop, the need for by-pass facilities will increase. However, the radial system, with the screen line controlling its capacity, must continue to carry the bulk of the traffic load to and from the important central business district.

The screen line traffic load of 17,000 v.p.h. vs its capacity of 16,650 v.p.h. The maximum inbound movement through the screen line occurs during the

morning rush with a load of 14,250 v.p.h. The maximum outbound load of 17,000 v.p.h. occurs during the afternoon rush period. Comparing this 17,000 v.p.h. now carried through the 29 gateways at the screen line with the practical operating capacity of only 16,650 v.p.h. points up a critical problem. The congestion experienced at the capacity controlling screen line confirms the fact that many of the gateways are badly overloaded during peak hours.

An Aggressive Street Improvement Program is Essential to Growth

Possible means of improvement. If the gateways through the screen line are overloaded today, naturally the question arises, how can we provide for the future growth of the City? The following possible means of relief have been proposed:

1) Construct by-pass, cross-town and circumferential streets to carry traffic, which does not have destinations within the area bounded by the screen line, around the area instead of through the crowded gateways and the congested central business district (see Fig. 5).
2) Construct expressways piercing the screen line thus creating additional high-capacity gateways (see Fig. 6).
3) Construct new surface gateways (see Fig. 7).
4) Improve existing gateways by:
   a) removing parking;
   b) installing staggered lanes;
   c) widening existing streets;
   d) employing various combinations of a, b, and c.

The proposed Major Street Plan uses every device. Five expressways form the "backbone" of the proposed plan. The heart of the central business district is surrounded by an expressway "ring." From this connector ring one expressway runs north and splits into a northwest leg and a northeast leg. Another runs east. The third runs east and southeast. The fourth runs south, and the fifth runs west. A series of strategically located circumferentials and cross-town routes are spaced at intervals outward from the central business district to tie together the expressways and relieve the radial feeder system. Major improvements for the radial system and the downtown streets are included to permit and encourage the dispersion of the traffic load (see Fig. 8).

The Proposed Major Street Plan Will Scarcely Meet 1980 Demands

All justifiable means used to increase screen line capacity. By-pass routes, expressways, new surface gateways, widenings by means of construction and no parking, one-way streets, staggered lanes and special traffic signal timing have all been assumed to increase the traffic carrying capacity of the screen line gateways which control the useful capacity of the Atlanta street system.

The estimated 1980 screen line demand of 53,600 v.p.h. vs a practical capacity of only 51,600 v.p.h. Lane capacities of surface streets were calculated with an average of 450 v.p.h. as the practical operating lane capacity and 500 v.p.h as the maximum possible lane capacity. On expressways, 1200 v.p.h. was used as the practical and 1500 v.p.h. as the maximum possible lane capacity. The proposed plan utilizes some of the streets to their maximum capacity. This heavy loading of some streets became necessary when the decision was made that it is impractical to add more traffic lanes through certain sectors of the screen line. The traffic demand at the screen line in 1980 has been estimated at 53,600 v.p.h. but the practical operating capacity of the streets

available under the plan is only 51,600 v.p.h. The difference between these two figures can be made up by loading some of the streets at or near their maximum possible capacities rather than adhering to practical operating capacities.

Some streets will be overloaded. In order to better anticipate 1980 traffic needs at the various gateways, the screen line has been divided into four sectors. (See Fig. 9)

(North Sector) The estimated demand for the north sector is 10,900 v.p.h. while the practical capacity is only 6450 v.p.h. and the maximum capacity only 7500 v.p.h. By loading all of the northbound gateways to maximum capacity, the deficiency can be reduced to 3400 v.p.h. Assigning 750 v.p.h. to leave the screen line westbound on Tenth Street and then turn north, and assigning another 2650 v.p.h. to leave the screen line eastbound on the N.E. Expressway, Piedmont Avenue and Boulevard before turning north to their ultimate destinations, makes possible a balance between demand and capacity for the north sector.

(East Sector) The estimated 1980 demand is 19,900 v.p.h. while the practical capacity is 21,900 v.p.h. However, the east sector has been asked to absorb 2650 v.p.h. from the north sector leaving a practical capacity of only 19,250 v.p.h. available for east sector traffic. This will undoubtedly result in some congestion on gateways in the east sector.

(South Sector) In comparison to the practical capacity of 11,700 v.p.h. the estimated demand in 1980 is 12,600 v.p.h. The difference can be made up by loading some of the gateways above the practical operating capacity at a figure near the maximum possible capacity.

(West Sector) The west sector is the least crowded of the four with an estimated demand of 10,200 v.p.h. and a practical capacity of 11,550 v.p.h. The 750 v.p.h. which the west sector has been asked to absorb from the north sector leaves available a comfortable 10,800 v.p.h. in practical capacity.

Expressways Must Supplement, Not Replace, Existing Radial Streets

Every existing radial street must be retained and improved. The proposed Major Street Plan includes five expressways through the screen line in addition to major widenings on nearly every existing gateway and the construction of several new surface gateways. However, even with these costly improvements, we can only hope to incr[illegible] the gateway capacity at the screen line enough to equal the demand that is expected by the year 1980. The expressways alone cannot solve our problem. If the traffic of the future is to have access through the screen line to the important central business district, all existing surface radial streets must not only be kept open across the expressway lines but they must be greatly improved.

The Life of the Downtown Section Depends on Surface Radials Plus Expressways

The most critical planning problem is connecting expressways to the downtown streets. Once the traffic has crossed the screen line enroute to the downtown section, the problem becomes one of unloading the high capacity expressways on low capacity downtown streets. This must be done still allowing the use of the downtown streets by traffic from the surface radial streets which feed the downtown section. There are three distinct phases to this problem:

1) Determine the amount of the future traffic load downtown.
2) Arrange the downtown streets for the most efficient traffic flow pattern and determine the capacity of this arrangement.
3) Design a system of ramps to provide the best possible ingress and egress for the expressways, while preserving the highest possible capacity on the downtown street system for feeding the "all important" radial streets leading from the downtown section through the critical screen line barrier.

The Estimated 1980 Downtown Traffic Volume Exceeds the Practical Capacity

The boundaries of the downtown section. Based on planning studies the downtown section of 1980 is expected to cover a larger area than the area which today is considered the downtown section. A cordon was thrown around this 1980 downtown section. The streets forming this cordon line are shown in Figure 10.

The estimated 1980 demand of 45,450 v.p.h. is conservative. In estimating the traffic volumes downtown for the year 1980, consideration was given to the ability of the downtown section to grow and to provide parking space; an increased use of transit, especially by all-day workers, was assumed; all reasonable assumptions regarding the by-pass of non-central district traffic were used; and, no adjustment was made for a change in driver habit due to the improved street system. These conditions tend to make the estimated demand of 45,450 v.p.h. a conservative figure. The breakdown of this estimated load (see Fig. 11) is as follows:

25,900 originate inside the cordon and are destined outside the screen line.
6,200 originate inside the cordon and are destined between the cordon and the screen line.
8,200 originate between the cordon and the screen line and are destined across the cordon area and beyond the screen line.
5,150 originate outside the screen line and are destined across the cordon area to some point outside the screen line.

The highest practical capacity downtown is 43,050 v.p.h. In an effort to obtain the highest possible capacity from the downtown street system, one-way streets (with due consideration for transit needs) were planned; no parking regulations were assumed; major widenings were assumed on Memorial Drive, Edgewood Avenue, Bartow Street and Magnolia Street; the Hunter Street Viaduct was planned as a four lane structure; and, the connections of Mitchell Street to Hunter Street, Capitol Avenue to Piedmont Avenue, Peters Street to Garnett Street, Cain Street to Magnolia Street, and Baker Street to Luckie Street were assumed. (See Fig. 12) The highest practical capacity obtainable on the streets and expressways crossing the cordon line into the downtown section, even with all of these improvements, is 43,050 v.p.h. The expressways were assumed to be carrying 18,300 of these vehicles and the surface streets the remaining 24,750 vehicles.

The Expressways Can Carry Only 2/5 of the Total Downtown Load

The expressway will be loaded to maximum capacity. The capacity of the expressway is limited. Contrary to popular belief, the expressway cannot carry the bulk of the downtown load. Actually the expressway cannot carry more than about 2/5 or 18,300 of the 43,050 v.p.h. which can be accommodated.

The maximum possible capacity of the expressway is 19,500 v.p.h. Its practical operating capacity is 15,600 v.p.h. (See Fig. 13). The expressway load assumed in our analysis is 18,300 v.p.h. which is in excess of its practical operating capacity. Of these 18,300 vehicles, 15,500 are assumed to be coming from within the cordon area and 2,800 are assumed to be through traffic. It is estimated that this assumed load of 18,300 v.p.h. will result in an overload on the expressway northbound from the proposed downtown Piedmont Avenue ramp to Peachtree Road, and on the East Expressway just east of Harris Street.

Surface Streets Must Continue to Carry Most of The Downtown Traffic Load

The excess 1980 demand may filter around the cordon area on minor streets. In the face of a peak demand in 1980 of 45,450 v.p.h. and an expressway capacity limited to 18,300 v.p.h., it is believed that a maximum of 24,750 v.p.h. can be taken across the cordon line on surface streets to bring the total capacity across the cordon line to 43,050 v.p.h. (See Fig. 14). It is also believed that the difference between the demand of 45,450 v.p.h. and the 43,050 v.p.h. capacity can filter around the cordon area on minor streets. Some of the 45,450 demand is through traffic which will use streets in the cordon area as long as they are available but which could use by-pass streets. Although all of the major streets will be loaded to capacity with radial traffic from the cordon area, some minor streets will be available for by-pass traffic.

The Ramp System Design Controls the Future Of the Downtown Section

The design can permit the maximum use of surface feeder streets. A consideration of ramp construction costs versus the service factor will show that adequate ramps can be provided without destroying any important capacity in the surface feeder street system.(See Fig. 15) The ramp design should have two main objectives:

1) It should provide the best possible service for the expressways.
2) It should preserve sufficient capacity in the local streets to permit the growth of the downtown section.

The following should be included as basic principals in the design of the downtown expressway ramps in Atlanta:

a) Balance ramp capacity with expressway capacity.
b) Locate ramps with reference to origin and destination information to minimize travel on local downtown streets.
c) Place ramps in pairs to prevent unnecessary circulation on downtown streets. If an unloading ramp is justified, a corresponding loading ramp of equal capacity is needed to return the movement to the expressway in the direction from which it came. Ramps are less expensive than street widenings in the downtown section. Too wide a separation of complementary ramps causes unnecessary use of surface streets.
d) Avoid connecting ramps to streets feeding the important surface radial system. Ramps tend to fill the street to capacity with expressway traffic and make it useless as a feeder for surface traffic beyond the ramp.
e) It appears that in the future it may be advantageous to make Whitehall Street and Forsyth Street a pair of one-way streets with Whitehall

Street northbound and Forsyth Street southbound. The ramp design should not prevent this arrangement.

f) Capitol Avenue and Washington Street also appear to be possible future one-way streets with Capitol Avenue northbound and Washington Street southbound. The ramp design should provide for this.

CONCLUSIONS

1) An excellent "team" of public and private agencies is working on the "Atlanta Plan."
2) Immediate action is indicated to relieve today's critical congestion.
3) An aggressive, large-scale street improvement program is essential to the growth of Atlanta.
4) Expressways are urgently needed as the "backbone" for an improved radial and added circumferential surface street system.
5) The existing "feeder" streets for the downtown section must not be cut off by the expressway roadway or by expressway traffic at ramp connections.
6) On and off ramps should be located to provide maximum service with a minimum of circulation on downtown streets.
7) The most efficient possible traffic flow pattern should be adopted for the streets of the downtown section.
8) Efficient transit routing is necessary for a healthy downtown section.

EXISTING STREETS FORM A RADIAL PATTERN

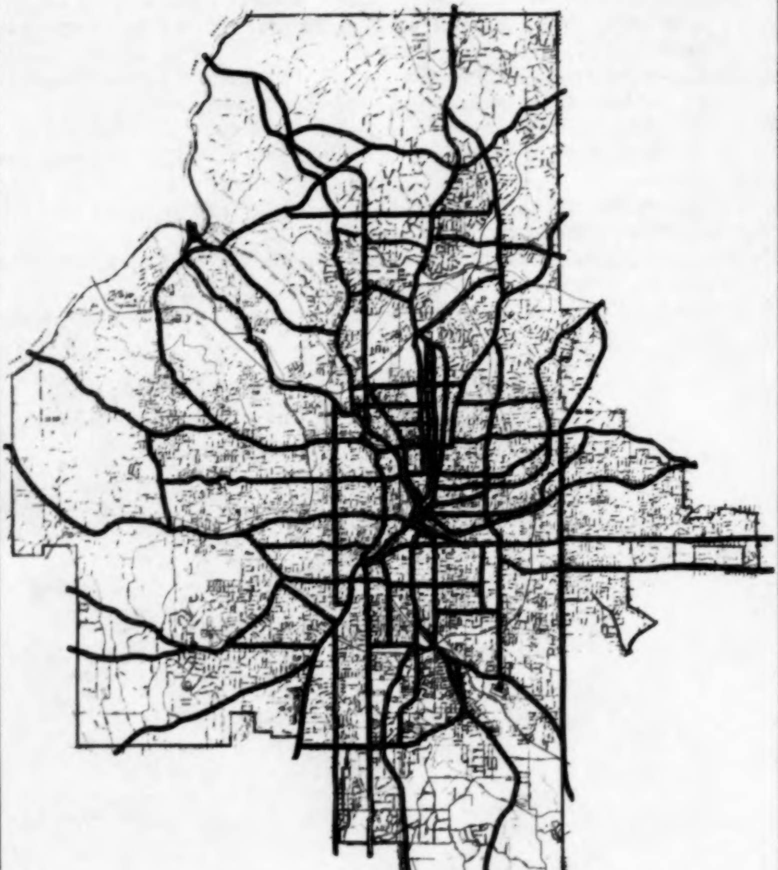

Fig.1

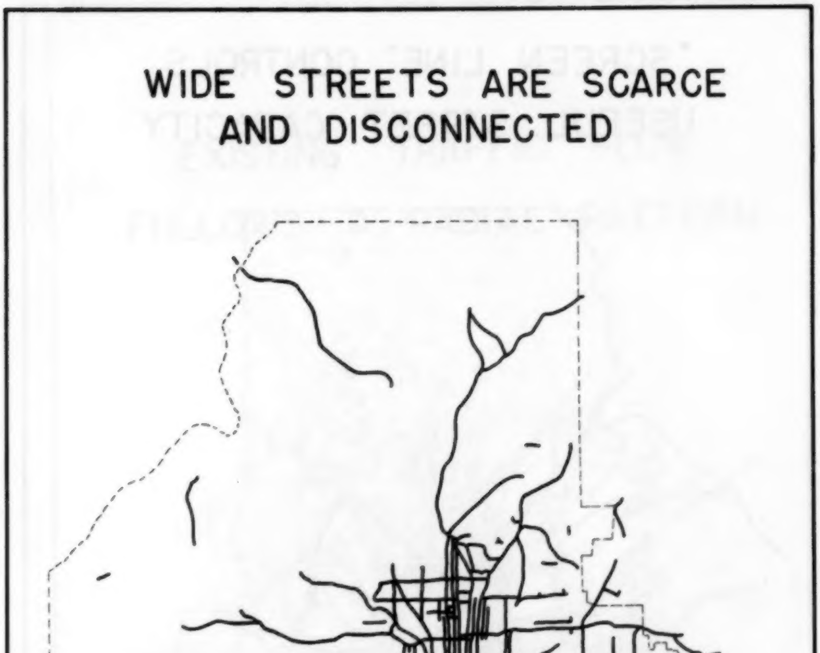

Fig. 2

"SCREEN LINE" CONTROLS
USEFUL STREET CAPACITY

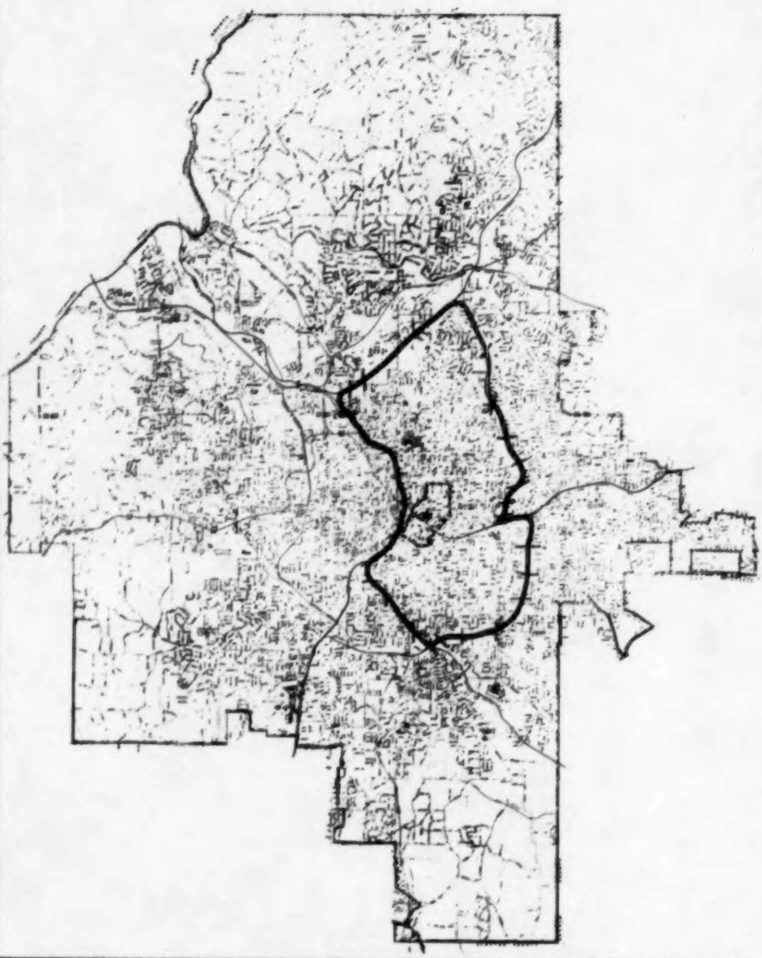

Fig. 1

EXISTING TRAFFIC FLOW FOLLOWS A RADIAL PATTERN

Fig. 4

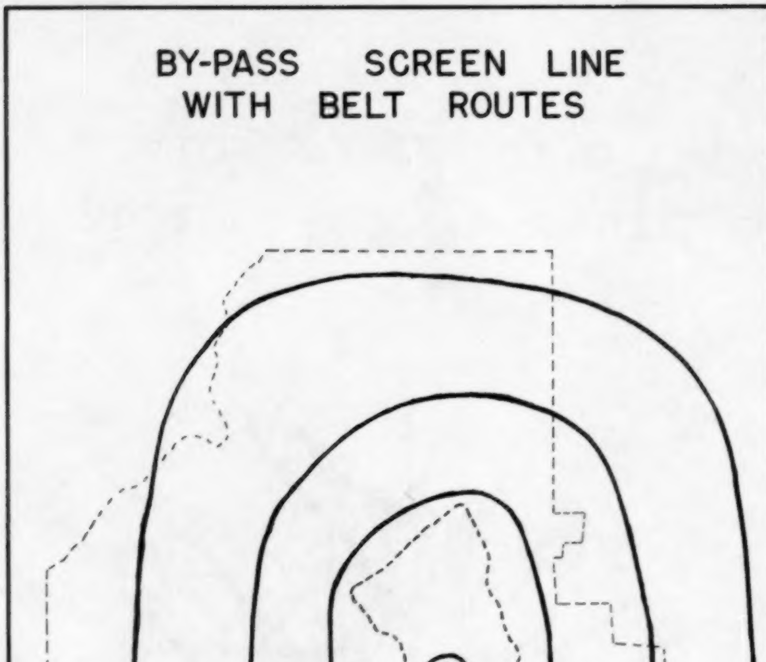

Fig. 5

USE EXPRESSWAYS AS THE BACKBONE OF THE SYSTEM

Fig. 6

IMPROVE RADIAL SYSTEM
AS FEEDER STREETS

Fig. 7

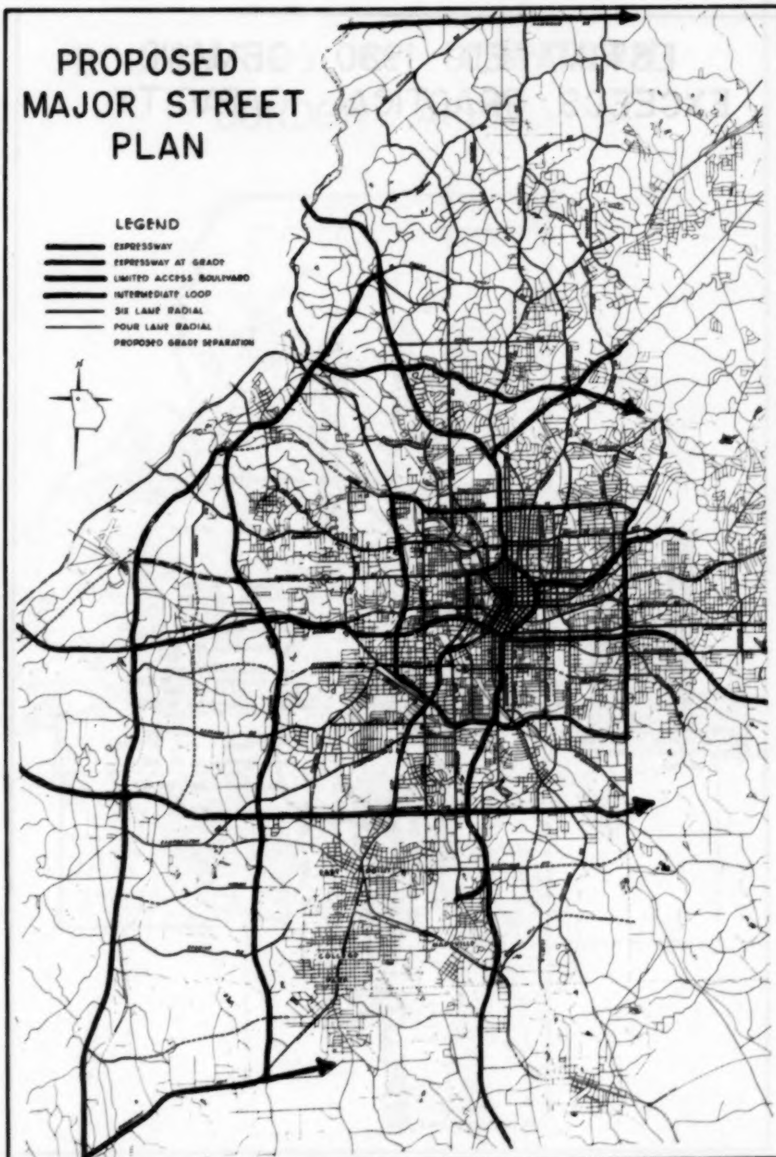
PROPOSED
MAJOR STREET
PLAN
LEGEND
EXPRESSWAY
EXPRESSWAY AT GRADE
LIMITED ACCESS BOULEVARD
INTERMEDIATE LOOP
SIX LANE RADIAL
FOUR LANE RADIAL
PROPOSED GRADE SEPARATION

Fig. 8

ESTIMATED 1980 DEMAND EXCEEDS PRACTICAL CAPACITY

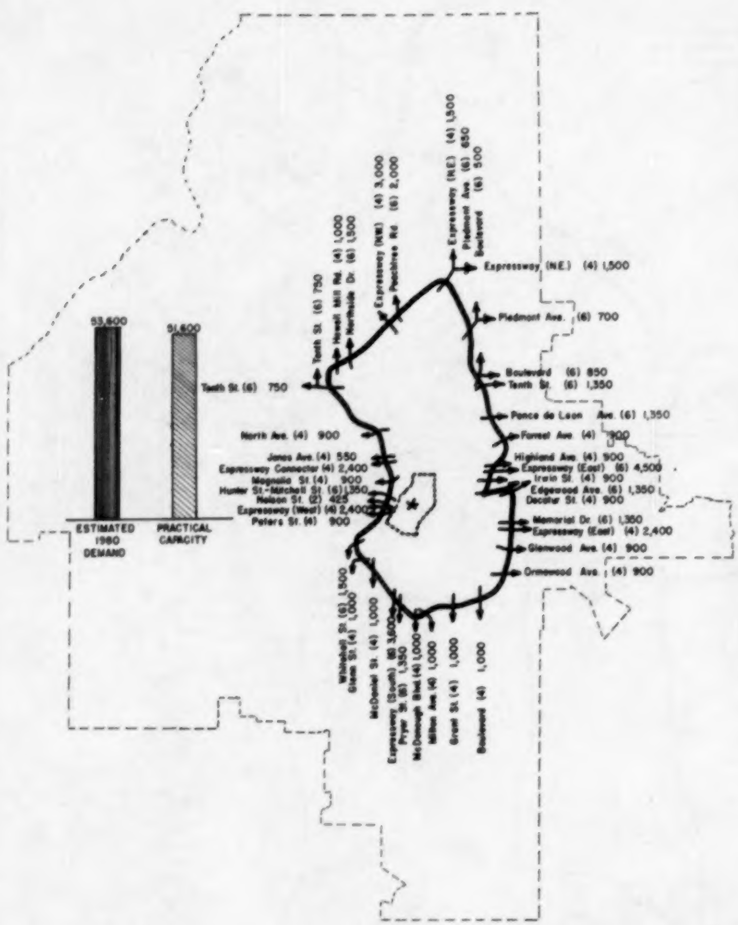

Fig. 9

BOUNDARIES OF DOWNTOWN "CORDON" AREA

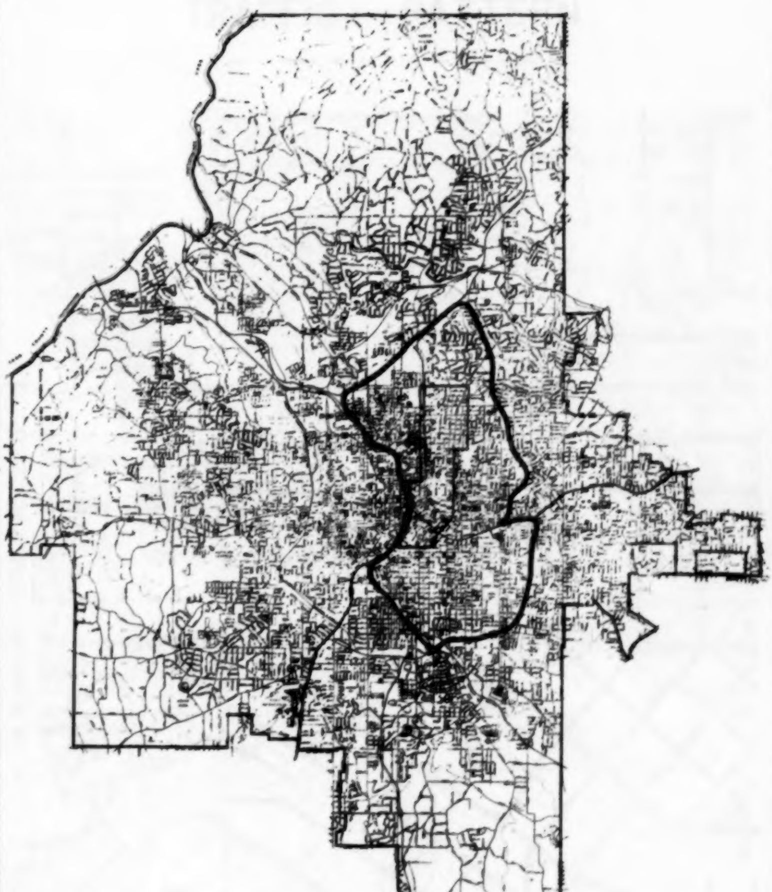

Fig. 10

A CONSERVATIVE ESTIMATE OF 1980 DOWNTOWN LOAD

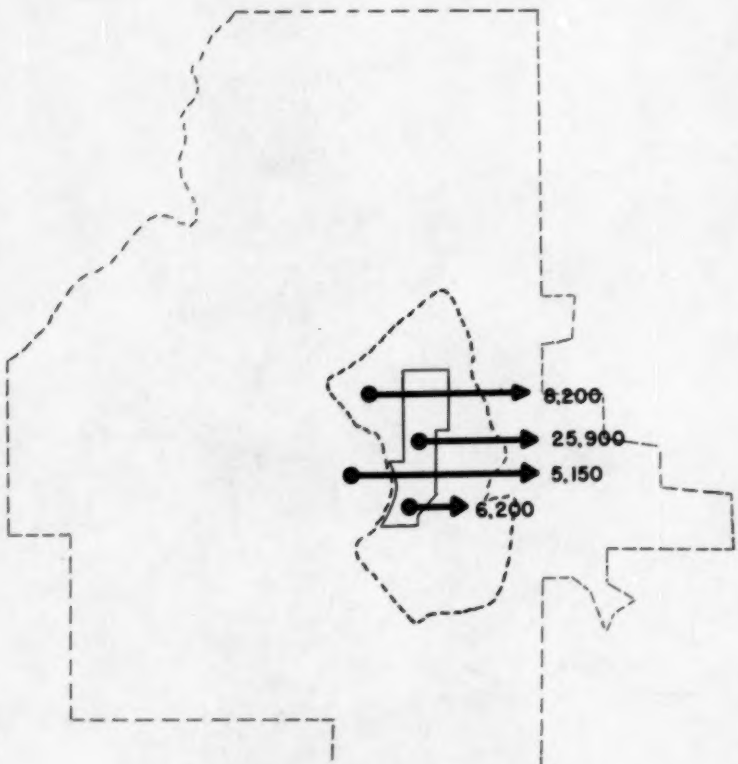

Fig. 11

PROPOSED DOWNTOWN TRAFFIC PATTERN

Fig. 12

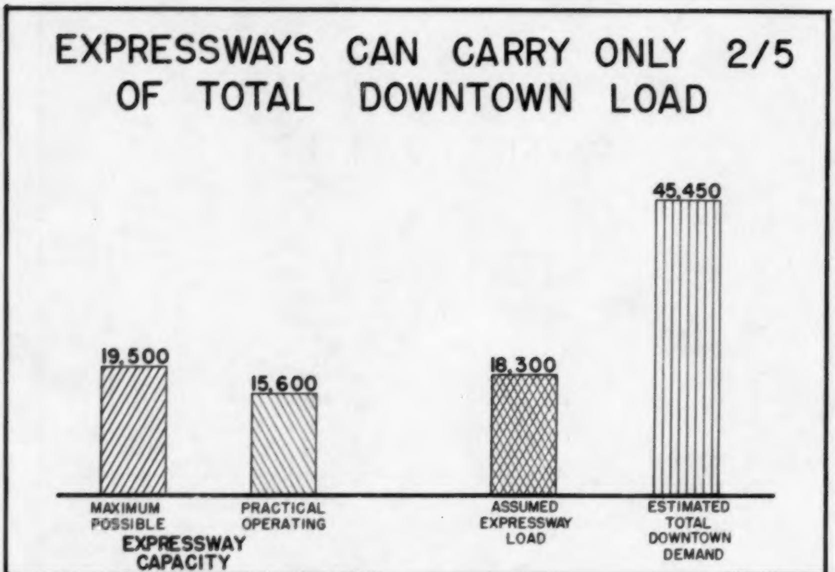
EXPRESSWAYS CAN CARRY ONLY 2/5 OF TOTAL DOWNTOWN LOAD
19,500
15,600
18,300
45,450
MAXIMUM POSSIBLE
PRACTICAL OPERATING
EXPRESSWAY CAPACITY
ASSUMED EXPRESSWAY LOAD
ESTIMATED TOTAL DOWNTOWN DEMAND

Fig. 13

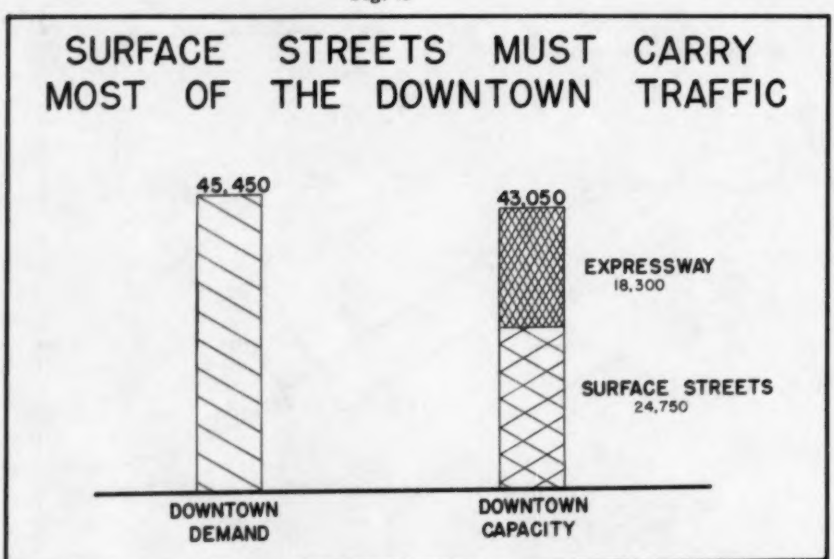
SURFACE STREETS MUST CARRY MOST OF THE DOWNTOWN TRAFFIC
45,450
43,050
EXPRESSWAY
18,300
SURFACE STREETS
24,750
DOWNTOWN DEMAND
DOWNTOWN CAPACITY

Fig. 14

PROPOSED DOWNTOWN EXPRESSWAY RAMP SYSTEM

Fig. 15